UNITED STATES DEPARTMENT OF AGRICULTURE
Research Program Development and Evaluation Staff
Washington, D. C. 20250

REPORT AND RECOMMENDATIONS

of the

THIRD MEETING

of the

ANIMAL AND ANIMAL PRODUCTS RESEARCH ADVISORY COMMITTEE

Philadelphia, Pennsylvania
March 14-18, 1966

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PREFACE

The third meeting of the Animal and Animal Products Research Advisory Committee was held in Philadelphia, Pennsylvania, March 14-18, 1966. Assistant Secretary George L. Mehren, chairman of the committee, was unable to attend. Vice Chairman Dr. Edwin R. Goode, Jr., Assistant Deputy Administrator, Agricultural Research Service, presided. Mr. Cecil Robinson, a livestock producer from Delaware, Ohio, and a member of the National Agricultural Research Advisory Committee, served as liaison representative between the two committees.

Dr. E. C. Elting, Associate Director, Research Program Development and Evaluation Staff, discussed administrative and budgetary developments and presented a statement of progress on the long-range study of agricultural research which is being conducted cooperatively by a special Federal-State Task Force.

During the public session on March 14, the following representatives of the organizations listed presented statements pertaining to research needs:

Livestock Conservation, Incorporated, by Bernard Ebbing
National Pork Producers Council, by W. E. Smith
National Independent Meat Packers Association, by Joe McDaniel
American Meat Institute, by Dr. Dewey Bond
Evaporated Milk Association, by Fred Greiner
National Dairy Council, by Dr. Elwood W. Speckman
Southeastern Poultry and Egg Association, by George Heitz
Institute of American Poultry Industries, by Lee Campbell
National Wool Growers Association, by Edwin E. Marsh

The following organizations submitted statements to the Committee prior to or during the meeting:

American Veterinary Medical Assn.
National Live Stock Producers Assn.
American National Cattlemen's Assn.
Dairy Industry Groups
American Dairy Assn.
National Milk Producers Federation
Poultry and Egg National Board
American Poultry & Hatchery Federation

The Committee, industry representatives, and USDA staff members toured the Eastern Utilization Research Laboratory at Wyndmoor, Pennsylvania, and were shown selected research developments including detergents from animal fats, meat flavor, milk protein, hide research, meat pigments, vacuum drying whole milk, and new and improved leathers - including the new shearlings that have attracted so much attention for use in hospitals as bedpads.

As a basis for its recommendations the Committee reviewed research progress reports which were supplemented by oral reports, visual materials, and discussions by leaders of research programs. Following these reviews and discussions the Committee divided into four subcommittees: (1) animal husbandry and livestock engineering; (2) animal health; (3) utilization, nutrition, and consumer use; and (4) marketing and economics. All subcommittee recommendations were reviewed by the entire Committee before they were approved for inclusion in the final report to be submitted to the Secretary of Agriculture.

Additional copies of this report may be requested from Max Hinds, Executive Secretary, Animal and Animal Products Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C. 20250

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I. GENERAL COMMENTS

Trends and Problems in the Animal Sector of the Economy

Relatively recent trends in our society focus attention on the real need for a new look at our agricultural situation and its future in terms of what will be required and our capability of meeting those requirements. Several trends that are becoming well established indicate that an abundant agriculture may easily and rapidly shift to one of scarcity unless new technology is developed for all elements of agriculture -- production, utilization, and marketing. These trends include:

1. Outmigration of people from rural and farm areas.
2. Increasing population and greater demand for agricultural products.
3. Increasing demand for high quality commodities produced to specifications.

Prior to World War II most of our American agricultural production was from many small diversified units. The combined production of these many units provided the needs of an increasing population at low cost. The returns to the livestock producer for his land, labor, capital, and management was generally less than that received by workers in other activities. Since World War II there has been a gradual decline in the number of producing units, with more and more of the production coming from highly specialized, high volume producers. All indications are that the trend will continue. The present structure requires that the returns from labor, capital, and management must be commensurate with that which can be earned by other industries. It becomes apparent that labor, capital, and management will not be invested in the production, processing, and distribution of agricultural products unless it is profitable to do so.

The U. S. Department of Agriculture has accepted mission obligations related to agriculture and society in general. The Committee commends the Department for establishing these missions.

If we accept the missions approach then it is appropriate to apply goals. Reasonable goals for the livestock industry would be:

1. Maintain or increase the per capita supply of animal and poultry products.
2. Minimize their costs to the consumer with commensurate income to agriculture.
3. Improve the quality of animal and poultry products as related to nutrition and consumer use.
4. Increase returns to the producer.

To achieve such goals it is primary that livestock production, processing, and marketing systems be developed that will allow for a continuous supply of animal and animal products in a manner that is more efficient in the use of labor and capital. Many areas need attention. Two important ones will suffice to emphasize the need for additional information.

1. The control of animal diseases. The estimated annual losses due to infectious and noninfectious diseases of cattle, swine, sheep and poultry are in excess of $1-1/2 billion annually. (USDA Handbook No. 291, 1965)

2. The need for systems that will make possible the more efficient use of labor. Many commercial livestock operations cannot support the increased labor costs of recent years. For example, sheepherders cannot be replaced at any price.

One of the missions of USDA is "to advance the level of living of individuals and families." This implies improved nutrition. Livestock and livestock products supply over two-thirds of the protein of our food supply. It is believed that the inclusion of additional animal products would improve the diets of many of our people. If these needs are to be met it becomes apparent that additional information is needed on how to produce, process, maintain, or improve quality, and to merchandise an everincreasing supply of animal products at a profit to each essential segment of the industry. We are concerned that the present level of research will not provide the needs of the future. Also, we recognize that the USDA cannot provide the total research effort. Rather, we look to the Department to marshall the forces that will bring about a desired national effort.

The Committee believes that the USDA should give especial direction to those problems that are national in scope or of industrywide significance. To be most effective, a total research effort should bring resources of the State Colleges and Experiment Stations as well as of industry to bear on specific problems.

To illustrate problems of national or industrywide significance -- we find that after more than a quarter century of adequate or surplus supplies of dairy products in the United States, it now appears that prospective supplies may be inadequate. We need to give attention to what brought this situation about and what lies ahead. What do we need to know and do to keep a viable dairy industry producing at prices that are reasonable to consumers? Another aituation pertaining to animal agriculture is the change in consumption of red meat and poultry. Following World War II red meats made up 87% of per capita consumption of meat - now they make up 80%. During this period pork and lamb have lost while the other meats gained in their proportion of per capita consumption. Neither pork nor lamb production have kept pace with population. Per capita consumption of pork dropped from about 70 lbs. to 59 lbs. Per capita consumption of lamb declined from about 5 lbs. to below 4 lbs. since World War II and had been at 7 lbs. prior to 1945. While these declines took place, beef consumption per capita jumped from 66 lbs. to 99 lbs.; ready-to-cook chicken increased from 19 lbs. to 33 lbs. and turkeys from 3 lbs. to 7 lbs. The increase in beef took place with rising prices; the increase in poultry consumption occurred during price declines of almost one-half. These shifts raise a question as to whether the declines in pork and lamb can or should be reversed. If so, what information and action are needed?

The Committee is concerned about such problems. In this report are a number of recommendations that, if implemented, would help the dairy, swine, and sheep industries make needed adjustments.

It is the feeling of the Committee that problems of this nature and scope need to be studied by interdisciplinary groups representing all segments of industry in order to provide analyses in much greater depth. Such studies should provide information that, if implemented, would bring about desired changes.

II. GENERAL RECOMMENDATIONS

Animal Wastes

The Committee expressed a strong endorsement for the quickest possible initiation of a program of research related to adequate equipment and techniques for coping with the rapidly increasing problems related to animal waste management, handling, and disposal. Although the problems are mostly of an engineering nature, the solutions will best come from a highly integrated multidisciplinary team of physical and biological scientists. The research should consider economic alternatives available to the producer such as use of the wastes for hydroponics and the production of gases for energy as well as the problems of contamination of water supplies and river basins by wastes, the effects on rural recreation, elimination of insect breeding places, aesthetic nuisances of dusts and odors and protection of public health. The Committee has noted the great public concern for pollution problems in the U. S. as pertaining primarily to urban areas and is concerned that the Department has only one professional person working directly on the problems of animal waste management and disposal in contrast with the millions of dollars being proposed for studies and action programs related to other pollution problems of urban areas.

The Committee recommends a greatly accelerated program of research related to animal wastes disposal and recommends that the Department of Agriculture proceed to formulate such a program at the earliest possible moment. The Committee feels strongly that leadership for such a program should be established in the Department of Agriculture -- to have it otherwise would not be in the best interests of the producer or to the rural population. The program should be of a magnitude to consider the needs both regionally and by classes of livestock; for example, dairy operations in heavily populated areas of the northeast where cold winters occur as contrasted with livestock feeding operations in the arid and hot southwest.

Salmonella

Salmonella infections in poultry meat and eggs constitute one of the greatest potential hazards in poultry production and marketing. Research is needed to determine sources of infection, adequate methods of detection, and adequate and safe methods of destroying salmonella in poultry feeds and poultry products. Presently, all salmonella typing has to be done at the laboratory at Ames, Iowa. Additional facilities are needed in order that the poultry industry may be afforded more prompt service in typing salmonella. Additional comments pertaining to specific research activities are included under "market quality", page 19, and "poultry diseases", page 9.

Increased Emphasis Needed for Agricultural Engineering Research

The Committee has noted with satisfaction during the review of progress, the evidences of increasing cooperation among the divisions, including Agricultural Engineering, on problems where such efforts lead to quicker solutions. Under U. S. animal production conditions where the supply of labor is decreasing or is available only at relatively greater costs, the role of farmstead mechanization is becoming increasingly important. Reduction of labor requirements is essential to a continuing stable industry and agricultural engineering research should be intensified. In addition to research which complements that of other disciplines, efforts should be devoted to problems of primary engineering interest such as new concepts in handling, management, and disposal of animal wastes, environmentally adequate structures, and farmstead water supplies.

Imbalance of Funds for Animal Husbandry Research

During the past few years a definite imbalance in assignment of funds to animal husbandry research has occurred as compared with other fields of farm research. The increase during these years has been about sufficient to cover the ordinary increment of rise in salaries over this period. The production efficiency of our animals is not such that we can let research problems aimed at improving them be held back by such a huge discrepancy in assignment of funds. We recommend that consideration be given to providing animal husbandry research with funds needed to bring this area of research up to that of other areas of farm research. This should provide for greater support under the senior scientists and provide for the expansion needed in basic biology, physiological and nutrition research on livestock and poultry when combined with genetics to lead to improved efficiency in all production factors.

Allocation of Funds for Entomology Research on Livestock

We are deeply concerned about the relative amount of support given to research on insects affecting livestock and poultry in contrast with that allocated to other aspects of research in entomology. With the animal sector of the economy contributing more than half the cash farm receipts of agriculture, we recommend a reappraisal of the allocation of research support.

Sheep Industry Vital to National Defense

The sheep industry is vital to the national defense of this country. It provides income for one out of every nine farm families. It utilizes profitably many lands that are not otherwise used. The industry is threatened with mounting competition from synthetic fibers and foods; increasing costs of raising sheep; increasing imports of manufactured wool fabrics; changing structures of marketing, manufacturing, retailing of industry products and changing consumer preferences. An additional threat to the continued health and growth of the sheep industry is the decreasing availability of public lands for raising sheep. Increasing demands for reclamation, watersheds, reservoirs, wildlife, and recreation areas are presenting formidable competitive factors to the sheep industry in the western area of the United States. The place of the sheep industry in the American economy needs to be kept in mind and research support provided.

Facilities

The Committee expressed interest in the following facilities -- some of which are completed or still in process of construction -- and some that are still in the proposal stage. In addition to the brief comments here, specific comments have been made in the particular section of this report dealing with the subject matter to be investigated at each facility.

Completed, under construction, or authorized:

The U. S. Meat Animal Research Center, Clay Center, Nebraska

The concern at this time is that funds will be provided to finish Phase I and the construction called for in Phase II and, thirdly, that the total program will be adequately funded.

Regional Laboratory for Food and Nutrition, Grand Forks, North Dakota

We are pleased that funds have been appropriated and urge high priority for its construction and development of the research program.

Poultry Research Laboratory, Georgetown, Delaware

It is understood that this facility will be completed in 1967. We recommend early development of plans for staffing, equipping, and supporting the program in production research.

National Animal Disease Laboratory, Ames, Iowa

There is need to establish a separate facility for the service program carried on as part of the operation and, at the same time, release space needed for research.

Toxicology Laboratory, College Station, Texas

Construction within the year will strengthen the research program on materials toxic to animals and man.

Poultry Laboratories at Athens, Georgia, and Starkville, Mississippi

Completion and staffing will effectively expand research on several serious and costly diseases of poultry.

Recommended:

Beltsville Parasitological Laboratory, Beltsville, Maryland

There is urgent need for a fireproof facility for the internationally famous Index and Catalogue of Medical and Veterinary Zoology and the parasite collection and additional laboratory work space.

North Central Dairy Cattle Research Laboratory

The Committee recommends establishment of such a laboratory to concentrate particularly on the use of roughages for dairy cattle.

Center for Producing Experimental Animals

Such a center is needed to produce disease- and parasite-free experimental animals of known genetic constitution to meet the increasing needs of expanded research programs. Data obtainable from highly refined instruments is ultimately dependent on the quality of the experimental animals.

Headquarters Facility for Food and Nutrition Research

We urge high priority for this facility in the Washington area so that research and administrative activities can be brought together in a single facility.

III. ANIMAL HUSBANDRY AND LIVESTOCK ENGINEERING

A. Facilities

1. U. S. Meat Animal Research Center. The Committee reaffirms and strengthens the recommendation made in last year's report on the establishment of a U.S. Meat Animal Research Center on lands formerly used by the Department of the Navy as an ammunition depot near Hastings, Nebraska. The Committee is pleased to learn that a substantial area of this land has already been assigned and that the remaining land will soon be assigned to this purpose. The Committee further is pleased that some operating and building planning funds have been provided for this Center. The Committee urges that all haste be made in providing needed funds to finish Phase I construction and to fund the construction of facilities planned in Phase II and that the total program planned be funded as needed to support the research. The projected facilities and research program with meat animal species at this very desirable location will in considerable measure fulfill a significant deficiency in the Department's meat animal research. The research planned will go far towards meeting the urgent needs of livestock producers to provide meat animals and animal products which the consumer wants and will buy and which can be processed by the packer with a minimum of waste. The research projected will also make an important contribution towards solving the reproduction problems of meat animals. The consolidation at this Center of existing outlying projects is sound research planning on the part of the Department. The Committee further urges that livestock housing and animal management research and meat animal quality and marketing research be added to the program of this Center. The Committee recommends that the program of the Center be developed and conducted cooperatively where possible with the State Agricultural Experiment Stations, particularly those in the North Central Region.

2. North Central Dairy Cattle Research Laboratory. The Committee recommends the establishment of the North Central Dairy Cattle Research Laboratory for the purpose of providing an integrated program of research on dairy cattle-forage utilization and to develop ways in which greater dependence can be placed on forage to provide the protein requirements for milk production. This would aid dairymen in meeting the high cost of protein from sources that are in direct competition with other uses and at the same time favor higher milk production and the yield of greater amounts of protein from milk. Such a laboratory would contribute substantially to the economic position of the modern family-size dairy farm by conducting investigations on: (a) the evaluation of forages as feeds; (b) the role of the rumen in forage utilization; (c) the effects of forage concentrate ratios on milk yield and composition; (d) the nutritional and production consequences of adjusting, harvesting, preserving and feeding practices in accordance with the economic changes; (e) the development of cattle that will utilize forages more effectively; and (f) increase the contribution of protein from forage and other nonfood materials to furnish the protein needs for high milk production. The proposed laboratory should be located on or adjacent to the campus of a land-grant institution. The research should be conducted jointly with the state in which the laboratory is located and should be planned cooperatively with the State Agricultural Experiment Stations of the North Central Region.

3. Poultry Research Laboratory, Georgetown, Delaware. The Committee is pleased to note that a new poultry research laboratory has been authorized at Georgetown, Delaware. It is the understanding of the Committee that this new facility should be completed in late 1967 at which time several research projects now being delayed, especially in poultry products quality as affected by management stresses, nutrition and physiological factors, can be programmed. The Committee recommends that plans be developed as early as practicable for the proper staffing, equipping, and support of this laboratory in order that a minimum of time will be lost after its completion before actual research can be initiated on projects for the benefit of the poultry industry.

B. Beef Cattle Production

1. Reproductive Inefficiency. Expand research in all respects, particularly as to genetic, physiological and management aspects that would improve efficiency of reproduction of females and males. Fertility is the number one problem facing cattlemen. More knowledge is needed on physiological genetics of beef cattle in relation to reproduction, nutritional needs for optimum reproduction and systems of breeding.

2. Carcass Quality. More research is needed to develop methods for increasing lean-fat ratios. Taste appeal should be researched further and excess fat elimination may best be approached genetically. Intensive studies of muscle development and fattening should receive more attention.

3. Breeding Systems - Crossbreeding. Work done to date suggests that continuation along these lines of research coupled with effective performance and progeny testing programs may result in greater gains in efficiency of meat production than any other. It should be strengthened and should include studies of specific breeds and crosses applied to specific farming situations, i.e., intensive or confinement rearing and feeding versus range conditions.

4. Improve Feed Efficiency. Expand basic research on ruminant nutrition with emphasis on utilization of urea and other nonprotein nitrogen sources. The ability of the ruminant to utilize nonprotein nitrogen as its sole source of dietary nitrogen makes it unique among domestic animals. Thus, it does not have to compete with simple-stomached animals for feed proteins. However, much more basic information is needed before rations can be developed on which performance will be fully normal. Roughage utilization should be vigorously studied.

5. Heifer Feeding. Expand research into nutrition and feeding methods to be followed with heifers to increase the rate of gain in finishing.

6. Individual Identification. The Committee commends the Animal Husbandry Research Division for promptly implementing the suggestion made last year concerning individual identification and urges continuation until practical methods have been found both for living animals (regardless of coat color) and their carcasses following slaughter.

C. Dairy Cattle and Milk Production

1. Mastitis Prevention. Mastitis is the most serious problem of the dairy industry. Research is needed to reduce losses from mastitis through management, environmental, physiological and genetic studies directed towards minimizing the incidence of this costly disease.

2. Milk Composition. There is need to develop and evaluate nutritional and physiological controls for the composition of milk and milk fat through studies on the factors altering the hydrogenating capacity of the rumen and the ability of the cow to alter milk fat composition physiologically. Studies also should be made on factors affecting feed intake including rumen metabolism and the relation of these factors to milk production and milk composition.

3. Reproductive Inefficiency. Physiological and management research needs to be expanded. Additional knowledge is needed which would increase the reproductive efficiency of dairy cows and bulls by reducing embryonic mortality, minimize ovarian dysfunction, improve semen production and increase the efficiency of semen utilization.

4. Basic Genetics of Physiological Traits. Research needs to be initiated and expanded on the biochemical, immunological and physiological traits of dairy cattle blood, milk and other tissues, in order to learn their relation to production and other performance characteristics, to determine the nature of their inheritance and to reveal new possibilities for early and accurate detection of superior animals.

5. Farm Records. Production efficiency and net incomes of producers could be improved by developing dairy farm records as a management planning aid by (1) expanding the scope of dairy production records to include physical quantities and dollar costs of production inputs for the whole farm as well as the dairy enterprise, and (2) developing procedures for using dairy production and feed records as a basis for determining the most profitable composition and amount of grain and forage to feed.

D. Poultry and Egg Production

1. Fertility and Hatchability. Improvement in fertility and hatchability of chicks and poults offers one of the greatest potentials for financial improvement in the poultry industry. Studies in physiology, nutrition, genetics, and management of poultry should be continued and expanded in this area.

2. Egg Production. It would appear that a plateau has been reached with regard to individual hen production. Further studies in nutrition, genetics, and egg formation might well lead to the lifting of this plateau.

3. Egg Breakage. Losses due to egg breakage caused by poor shell texture are of considerable concern to the commercial egg and hatching industry. Work needs to be done on factors affecting egg shell quality including studies in nutritional requirements, environment, and genetics.

4. Feed Utilization. Methods to improve feed efficiency in all types of poultry deserve continuing study. The relationships of disease, environment, water quantity and quality, nutrition, and manure disposition should be carefully researched.

5. Breast Blisters. Research is needed in nutrition, management, and breeding to determine the causes of breast blisters in broilers and turkeys, a source of substantial downgrading and economic loss to the poultry meat industry.

6. Composition of Feed Ingredients. Lack of information concerning the chemical composition of feed ingredients used in poultry rations is a severe handicap in formulating optimum rations. Much of the information now available is too general or outdated. Research should be undertaken to determine the quantitative and qualitative composition of basic feed ingredients and new ingredient analysis tables developed for use by the poultry feed industry.

7. Fat Metabolism. In many instances broilers are reported as slick and greasy during processing. Not only does this condition reduce processing yields but large numbers in a particular lot cause mechanical problems in processing. Basic studies in fat metabolism, together with studies in sources of fat and processing procedures, should be undertaken to solve this problem.

E. Swine Production

Historically, swine research has not been supported in relation to the importance of the industry in the agricultural economy. Therefore, it is recommended that swine research be rapidly elevated to the level commensurate with its economic importance.

1. Carcass Quality. Changes in consumer eating habits have brought about rapid changes in carcass quality in swine. To meet the needs of consumer demand further improvement is needed through basic research on the genetic, physiology and nutritional aspects of efficient production of a lean, meaty, quality product.

2. Reproduction. Production efficiency and carcass quality can be rapidly improved if estrus synchronization could be achieved to utilize artificial insemination with outstanding sires. Expanded and intensified research is needed on factors affecting estrus detection and synchronization; ovulation, implantations and fetal development; semen production, handling and long-time storage and genetic, nutritional and environmental influences on reproductive performance in both males and females.

3. Physiology of Growth and Development. There is an urgent need for information on physiological functions and body processes during growth, development and reproduction to increase the effectiveness of all areas of swine research and identify physiological traits under genetic control which can be utilized to improve efficiency and product quality under different nutritional and environmental conditions.

Research that will reveal the physiological mechanisms that come into play that affect muscle growth and fattening and the stages at which these physiological processes take place would aid materially in the production of hogs with the desired fat-lean ratio and could contribute to greater efficiency in production.

4. Breeding and Genetics. Research in this area needs to be accelerated with emphasis on selection for different important single traits, interrelationships of different single traits with each other and with environmental factors, identifying physiological and biochemical responses under genetic control, and extending knowledge of genetic principles by increased use of laboratory organisms and computer techniques to develop more effective methods for improving seed stock herds and their use in commercial swine production.

5. Management Systems. There is need for interdisciplinary research on economies of management systems in swine production. Management systems need to be developed that increase the efficiency in handling hogs through all stages of production at the lowest possible costs.

F. Sheep and Wool Production

1. Carcass Quality - Consumer Preferred Lamb. Further research is needed to determine actual cutout value of lamb carcasses and how this can be determined when evaluating a live lamb.

a. Methods of more accurately determining on a live animal the thickness of fat at the twelfth rib, size of the loin eye and percentage of trim to preferred cuts.

   The above is included in the recent recommendation of the Industry-wide Lamb Committee and is in line with their efforts to set up specifications which would supply more acceptable products to the consumer at minimum cost to other segments of the industry.

b. Standardized methods of fully evaluating the lamb carcass and its cutout value which are to be used in the many carcass contests across the country.

c. Based on the information in (a) and (b) above, breeding research is needed to learn how to rapidly develop and introduce into the sheep industry that type of sheep which will produce the consumer-preferred lamb.

2. Reproductive Inefficiency. Continued research is needed to improve reproductive efficiency by increasing ewe fertility, lambing rates, multiple lambing, lamb survival before and after birth, and diagnosis of pregnancy and removal of seasonal restriction. Controlling estrus period would allow for the production of three lamb crops in two years or possibly two lamb crops per year. A method to determine the ovulation rate of the ewe is needed.

3. Wool Quality and Production. Further research is needed to improve fleece weights and wool quality by studying genetics, physiology, and endocrinology of follicle and fiber development as related to wool production.

4. Artificial Insemination of Sheep. To successfully inseminate the ewe and store frozen ram semen would allow widespread use of superior rams and ewes and result in speeding production of consumer-preferred lambs and high yielding wool-producing sheep. Freezing ram semen is most difficult and needs development.

5. Breeding Efficiency of Rams. The development of a rapid and accurate fertility testing procedure would eliminate the nonproductive rams and allow a more consistent uniform lambing.

6. Weaning Weights. More information is necessary to determine at what age range lambs should be weaned in order to obtain the maximum gain efficiency in the feedlots and to return the greatest economic benefit to the producer.

7. Breeding Systems and Crossbreeding. Continued research to continue lamb and wool production and efficiency is necessary by comparing breeds both pure and crosses. More energy is needed in performance and progeny testing of rams. Semen could be imported for experimental purposes from foreign countries where sheep produce 5 to 7 lambs per year.

8. Nutrition. Efficiency of feed conversion is one area in which the sheep industry has a long way to go compared with many other segments of the meat industry. It is necessary that the lambs' conversion ratio be lowered in order for the sheepman to compete in the livestock feeding industry.

9. Heritability Studies. More knowledge of heritability would be of considerable value to the sheepman in his breeding program, especially those factors affecting body weight, body type, body condition; fiber characteristics such as staple length and diameter; fleece characteristics such as grease weight, grease length, and clean weight.

G. Angora Goat Production

1. Reproduction and Management. Additional research is needed to improve the reproductive rate of the Angora goat and to develop and improve management practices. It is necessary to develop a method whereby a freshly shorn Angora goat exposed to low temperature, wind and rainfall will not die. This might possibly be done by application of proper liquids to coat the animal and to protect it from the elements.

H. Agricultural Engineering pertaining to Livestock

1. Environment. Much more basic information needs to be learned in the laboratory in order to determine optimum environments for farm animals. Specific data are needed on the influences of the various factors such as temperature, humidity, air motion, thermal radiation, and light on growth, health, fertility, production, feed consumption, and heat and moisture dissipation. Structures and equipment for economically providing the optimum environments under practical production conditions need to be developed, field tested and evaluated.

2. Mechanical Insect Attractants. Because of the increasing emphasis on pesticide residues in animal products, there is growing interest in the possibility of destroying insects with mechanical devices. We urge an expansion of research in this area.

3. Livestock Instrumentation. Lack of suitable instrumentation has placed severe limitations on livestock research effectiveness. More suitable instrumentation should be developed and improved for both basic and applied research such as the Scanray ultrasonic reflectance meter for back-fat measurement.

4. Mechanical Milking and Mastitis. Basic multidiscipline research on the mechanics and physiology of milking is needed to determine more definitely the relation of mechanical milking to the incidence of mastitis and to develop new or improved milking equipment.

5. Meters to Measure Milk. Research is needed to develop suitable meters for use in measuring individual cow production and bulk milk from tank to tank.

IV. ANIMAL HEALTH

A. Facilities

1. Beltsville Parasitological Laboratory. There is still immediate and urgent need for the early construction of an adequate facility for fireproof housing of the internationally famous Index Catalog of Medical and Veterinary Zoology, the parasite collection and sufficient laboratory space for the necessary research in all phases of parasitology.

2. National Animal Disease Laboratory. There is need for more space for research activities to permit expanding and intensifying programs on several diseases of animals and poultry. This can be accomplished by providing a separate facility for regulatory activities now located at NADL and adapting the vacated space for research activities.

3. Toxicology Laboratory at College Station, Texas. Construction of this laboratory within the next year will provide facilities for much needed research on materials that are toxic to animals and man. It will supplement and expand the program at the Kerrville, Texas, laboratory.

4. Poultry Laboratories at Athens, Georgia, and Starkville, Mississippi. Completion and staffing of these laboratories is effectively expanding research on several serious and costly diseases of poultry.

5. Center for Producing Experimental Animals. It is recommended that a center be established to produce disease- and parasite-free animals. The major limitation in the field of biomedical research has been the failure to develop adequate sources of the most important research tool -- the disease-free animal. Data obtainable from highly refined instruments is ultimately dependent on the quality of the experimental animals. Under this proposal a center would be established to develop experimental animals free of a wide range of pathogens and of known genetic constitution. Germ-free animals can be raised, they will reproduce, and the numbers are limited only by the equipment and facilities available. Research results with such animals would be much more accurate and meaningful.

B. Beef Cattle Diseases

1. Anaplasmosis. A disease caused by a blood parasite continues to cause serious losses both in morbidity and mortality in beef cattle. A vaccine has been made available recently. An urgent need exists for additional research leading to control and eventual eradication of the disease. These studies should include research to determine the mode of spread to susceptible animals. Anaplasmosis is not restricted to cattle but also exists in some wildlife species.

2. The Respiratory Disease Complex continues to be the cause of greatest morbidity and mortality losses in beef cattle. The true etiology and pathogenesis of this complex are not known because of the likelihood of mixed infections (viral, rickettsia, and bacterial).

3. Calf Scours. An enteric condition possibly due to viral and bacterial infections causes serious losses in beef cattle in some areas of the country where 10% to 20% of the calves born die before reaching 6 months of age. There is urgent need for expanded studies to develop preventative methods in order to reduce and/or eliminate this disease condition in young calves.

4. Foot Rot. An infection in the feet of cattle, especially in beef cattle in feedlots and on the range, causes severe lameness. It interferes in the animals moving about to obtain sufficient nourishment and water and is responsible for loss in weight and growth of the animals. The true cause of this condition is not known and research is urgently needed to develop ways and means of prevention.

5. Pinkeye (Infectious Kerato Conjunctivitis). The cause or causes of this condition are not known and expanded research is needed in order to better understand this problem that is widespread in this country. The limited efforts and reports from recently initiated research at the National Animal Disease Laboratory are appreciated, however, expanded effort is warranted.

6. Virus Diarrhea - Mucosal Disease Complex. These diseases caused by viral agents are responsible for serious morbidity and mortality in cattle. Expanded research is needed to control and eliminate the condition.

7. Vibriosis and Trichomoniasis. Infections of the reproductive tract of cattle caused by bacteria (Vibriosis) and protozoa (Trichomoniasis) result in abortions and infertility problems in cattle. In some areas of the country such infections are responsible for serious losses in calf crops and although a vaccine has been made available for vibriosis, continued and expanded research is recommended.

8. Leptospirosis. This disease can be caused by several strains of bacteria and causes serious illness of young cattle and abortions in adults. The mode of spread of infection from herd to herd is not known and more research is needed. Other animal species and humans also contract this disease.

9. Bovine Lymphosarcoma (Leukosis) is a form of cancer in cattle. The cause is not known, however, recent research indicates that it may be of viral origin. The mode of spread of this disease is not known. Because of the problem in certain herds and the potential public health hazard, expansion of research is highly recommended.

10. Bluetongue, primarily a disease of sheep, is a threat to cattle as possible carriers of the virus. Research is needed on this problem.

11. Brucellosis (Bang's Disease). Much progress has been made in recent years in the eradication of this disease; however, further study is needed for the development of a new brucellosis test that would more accurately distinguish between reactors that have been naturally infected and those that have been vaccinated.

12. Tuberculosis. While great strides have been made in the eradication of tuberculosis in cattle, there still remain areas of the country where from time to time serious incidences of the disease are detected by testing cattle and/or in carcasses when inspected at the slaughter plants. Improved test procedures (new and more specific tests) should be sought and more frequent testing of animals is recommended.

C. Dairy Cattle Diseases

All of the diseases noted under "Beef Cattle" are also of significance to dairy cattle. Research results will be of value to both.

1. Mastitis. An infection of the mammary gland (udder) caused by a variety of microorganisms continues to be the most costly disease in dairy cattle. Many factors influence this condition and expanded research is vitally needed in order to develop methods and means to reduce the incidence of this disease.

2. Metabolic and Digestive Disturbances need additional investigation. Milk fever (hypocalcemia) and acetonemia (ketosis) in dairy cows are responsible for substantial losses and impaired performance.

D. Poultry Diseases

1. Avian Leukosis. Leukosis continues to be one of the most baffling and costly diseases of poultry flocks, both from the standpoint of mortality and condemnation at the processing plant. No effective and reliable preventive measure or treatment is currently available. It is important that basic research regarding the precise relationship of the various etiologic agents and hosts be established. Continued and expanded effort is recommended. Also, the Committee notes with interest the progress and research on Marek disease (acute type of leukosis) during the past year. The Department is commended for its decision to place emphasis on this phase of the research at more than one location and urges a continuance of this policy.

2. Mycoplasma (PPLO). The indications are that mycoplasma species are responsible directly or indirectly for the extremely high incidence of disease in poultry. Evidence of such infections is responsible for the condemnation of many broilers. Techniques and tests to identify infected birds and flocks are needed as well as procedures to protect susceptible birds. Because of the widespread incidence of the disease complex, expanded research is urgently recommended.

3. Salmonellosis. The widespread concern with salmonella contamination in processed poultry products requires expanded research directed to all possible sources of initial exposure during the production of poultry meat and eggs on the farms. Emphasis should be placed on identifying the significance of carriers such as wild birds, rodents, insects, feed, litter, water, dust, and humans. (See also "general recommendations", p.v., and "market quality", p. 19.)

4. Coccidiosis. This disease in poultry is widespread and many new compounds are available for coccidiosis. Also, a vaccine is used in some areas. However, this remains a serious problem in many poultry-producing establishments. Continued basic research is warranted to develop new and improved methods for the control of this important problem.

5. Gumboro Disease (Avian Nephrosis), a recently recognized disease, causes significant losses in young chickens. Research should be initiated to develop methods of control and eradication.

6. Capillaria (thread worms) are very small round worms that burrow into the lining of the crop and intestines. Research is needed to develop methods of control in laying flocks, especially those confined in cages.

7. Chiggers. These are small external parasites that infest young poults and cause intense skin irritation and even death from toxemia. They also render older birds unfit for marketing. Research is needed to develop control methods.

E. Swine Diseases

Research on diseases of swine is still far below the level that is justified by the importance of the swine segment of the animal industry. It is recommended that this situation be corrected and that special emphasis be given to:

1. Abscesses, which occur in the neck and jowl but may develop in other parts of the body. They frequently cannot be detected until slaughter and cause substantial loss of edible parts of the carcass. Annual losses are estimated at over $12,000,000 annually.

2. Respiratory Disease Complex, which includes virus pneumonia, influenza, and pasteurellosis, needs further investigation. Mycoplasma (PPLO) may also be involved, with possible extension of infection to the joints, reproductive system and other organs. Confinement rearing is intensifying the problem. Morbidity and mortality are high.

3. Mastitis-Metritis Complex, which affects the uterus and udder, is responsible for heavy losses of young pigs through failure of the sows to produce milk. During the past year there has been increased recognition of this disease complex and additional research is needed.

4. Enteric Infections are responsible for serious losses in young pigs. Availability of a vaccine for transmissible gastroenteritis (TGE) is an important advance but much remains to be learned about the disease.

5. Atrophic Rhinitis, which occurs in the turbinate bones of the nasal passages, causes serious weight loss and stunting in young pigs. Secondary infection may involve lungs and other organs. The limited knowledge at present is the basis for more research.

6. Hog Cholera. Encouraging progress is being made in the eradication of the disease. There is need, however, to continue research on diagnostic methods.

F. Sheep and Goat Diseases

1. Epididymitis. A frequent cause of sterility in valuable rams is seen in purebred as well as range bands. More research is needed on the disease and to determine the effectiveness of a vaccine which has recently been developed.

2. Mastitis. The economic loss from mastitis is of serious concern to producers. There is need for further research on the prevention and control of this disease.

3. Foot Rot. Continued research is needed for the control and eradication of foot rot which should be accompanied by an educational program for producers.

4. Scrapie. This disease is a serious threat to the economy of the goat and sheep industry and requires an accelerated program of research because of the long incubation period and mode of spread.

5. Vibriosis. There is need for continued research to develop an immunizing agent for the control of this disease.

6. Bluetongue. Research is needed to determine whether the disease can be transmitted to cattle and the importance of both species as reservoirs of the virus.

7. Urinary Calcali. High death rate of animals in the feedlot necessitates continued research to reduce losses of sheep from this disease.

8. Caseous Lymphadenitis and Sarcosporidiosis are responsible for high condemnation of carcasses and research is needed to develop methods of eradication.

G. Horse Diseases

There is continued increase in production and use of light horses. Research on diseases of horses should be resumed at an early date. Problems of immediate concern are:

1. Equine Piroplasmosis, a blood disease transmitted by ticks.

2. Equine Infectious Anemia (Swamp Fever) is a virus disease transmitted by insects. Effective diagnostic methods need to be developed.

3. Reproductive Diseases. The conception rate in mares is often low because of infection of the reproductive organs. There is a serious lack of information on such problems in all species of livestock.

4. Nutritional Diseases frequently result from our lack of information about the nutritional requirements of horses.

H. Laboratory and Companion Animals

Vast numbers of animals of many species are used for biological and medical research. Their use has resulted in much research progress. However, there is a need for added information on diseases of these animals to improve and increase their usefulness. Pet and companion animals will continue to increase in numbers as our suburban population increases. Sales of pet foods, which contain a high percent of agricultural products, amount to almost a billion dollars annually.

I. Parasites

Man is losing the battle with internal parasites. Changes in livestock and poultry management -- close confinement rearing which concentrates large numbers of animals in small areas -- have contributed to the parasite problem. This situation emphasizes the urgency of the need for accelerated research on parasites that affect all species. Especially important is the need for knowledge about the role of parasites in transmitting infectious diseases. Continued research is necessary to develop more effective and longer lasting effects of anthelmentics and larvacides.

1. Gastrointestinal Parasites are responsible for extensive morbidity and mortality, especially in the young of all species. They also cause lowered efficiency of production in adult animals.

2. Trichina. Trichinosis is a problem which receives from time to time publicity in the popular press because of the occurrence of acute cases of the disease in humans purported to have consumed raw pork. Such publicity tends to depress locally the sale of pork. Also, the presence of the parasite in American pork adversely affects the export market for this commodity. Intensified efforts need to be made to determine the sources of infection for pork so that steps could then be taken to eliminate such reservoirs of infection.

J. Toxicology and Poisonous Plants

Residues of insecticides, herbicides, and radioactive fallout in plant and animal tissues are serious problems because of their public health implications. There is great need for the identification, control, and eradication of plants poisonous to livestock such as halogeton, bitterweed, and locoweed. Also, there is a need to further develop antidotes to control losses from these plants.

K. Insects

The Committee was concerned about the relative emphasis given to insects affecting livestock and expressed its feeling in a general recommendation.

1. Biological Control. The Committee commends the Department for the progress that is being made in biological control of some of the most serious insect pests, notably horse flies, stable flies, and face flies. It is recommended that research in this area be expanded and that research be accelerated on other control methods.

2. Vectors of Disease. Studies on the role of insects and external parasites in the transmission of diseases of livestock should be increased. These investigations should include ecology of the insect under field conditions, the life cycle of the disease in the insect, the normal and abnormal morphology and histology of insect tissues in relation to disease transmission.

3. Cattle Grubs. The Committee was impressed by information about the cattle industry's effort to control and eradicate cattle grubs. It is estimated that cattle grubs cost the industry between 100 and 350 million dollars annually. Studies have shown that grubs can account for losses of $5 to $35 per head in carcass and hide damage. Developments in recent years have given this situation a new significance -- export demand for U. S. Quality cattle hides has been reflected in a price rise from a depressed condition to one that represents a fair market value. During the past three years our annual outflow has risen from seven million pieces to well over thirteen million pieces, nearly half the domestic production.

Not only is there need for additional research but use of present knowledge would go far in attacking this problem. The industry requests (a) assistance from the Extension Service in disseminating existing knowledge and (b) additional research to deal with a number of unanswered questions such as certain activities of the adult heel fly, development of new drugs, metabolism of organic phosphates in animals, artificial rearing techniques, more effective grubicide controls for dairy cattle, and toxicity and residue studies.

4. Scabies of sheep, or scabs, are caused by tiny mites which live on blood serum. Their feeding causes skin lesions leading to much discomfort of animals and loss of wool leaving bare patches of skin. Continuation of the accelerated eradication program is essential.

V. UTILIZATION, NUTRITION AND CONSUMER USE

A. Utilization Research

Optimal satisfaction and optimal nutrition for individuals and families from a natural abundance of animal derived foods and other products provided from a healthy agricultural economy and associated industries are prime goals of research in this field of utilization, nutrition, and consumer use.

This Committee seeks to recommend research which will give all segments of our agricultural complex from farm and ranch through the channels of marketing, processing, and distribution a useful base of fundamental information as a springboard for successful innovation to meet the changing social needs and economic demands, consumer satisfaction, and protection.

Consideration has been given to obtaining maximum benefits from the necessary costs to meeting the most urgent immediate needs and long-range aspirations in proper balance, to tackling problems with good outlook for solution and the production of results with a high likelihood of successful adoption in practice. Also, we have given preference to those lines of activity that take advantage of the unique situation, facilities and talents of the Department organization that produce results not likely to be obtained elsewhere.

1. Milk and Dairy Products

   a. Flavor. Because flavor so largely determines a milk product's fate in the marketplace and because the lead time between the findings of flavor research and their commercial exploitation is usually fairly long, the Committee recommends that considerably increased emphasis be placed upon broadly conceived basic research relating to the flavor of milk and milk products.

   b. Instant Whole Milk Powder. The Committee recognizes development of a flavor-stable beverage quality instant whole milk powder as a prime goal toward which substantial progress has been made and recommends that all avenues of research, evaluation, and development leading to commercial acceptance be vigorously pursued and that adequate time and funds be provided to complete this project.

   c. Bacterial Spores. Greater emphasis should be given to basic biochemical research on bacterial spores to elucidate the mechanism of spore dormance and spore germination which would make possible lowering the degree of exposure to heat during processing, resulting in a corresponding increase in the quality of sterilized milks and other foods.

d. Milk Fat. The Committee is pleased to note that its earlier recommendations for research on milk fat, butteroil and ghee have resulted in valuable leads toward the utilization of this milk component. It now further recommends expansion of basic and applied research on milk fat and its fractions with emphasis on their flavor stabilities, physical properties and suitabilities for specific food uses.

e. Low-fat Cheese. Continue pilot plant testing of the laboratory procedure for making low-fat cheese and initiate development of a flavorful processed low-fat cheese.

f. Whey. Because whey is an important food resource now diverted to less important uses, improved techniques should be sought for concentrating whey and upgrading its quality and research should attempt to work out means of usefully incorporating whey solids into a variety of foods for humans.

g. Stabilizers. The Committee commends the research which has demonstrated the effectiveness of polyphosphates in stabilizing the fluidity of concentrated milk and advocates continued research to discover the full range of application of these additives and heat-sterilized milk products.

2. Meat

New methods for controlling microorganisms such as staphylococcus, salmonella and spore-forming microorganisms in meats and meat products should be developed, particularly nondestructive methods that can be used to prepare products of high quality but with low microbial loads.

Basic work on meat composition including research on proteins, lipids and flavor constituents should be expanded and combined with technological and engineering studies. These studies should be carried forward to the point where they can be applied by industry to the improvement of existing meat products and to new product development. Specific examples of such research are:

a. Quality Safeguards in Meat Products. The expanding meat industry, with more products of widely different characteristics and components being shipped and stored in everwidening market channels, needs additional basic information on microorganisms that endanger such products and needs economic processes for putting such basic information into practice. Occasionally there have been reports of contamination in meat products that could threaten health and safety. As one of the initial steps, research should be initiated to determine the relationships of specific processing techniques to microbial growth. Another phase of the research should be devoted to studies of natural inhibitory substances in meat products and their effects on the viability, infectivity, toxigenicity, and pathogenicity of selected microorganisms. Processes would be modified or developed to put these findings to practical application.

b. Low-cost Dehydration for Cheap Cuts of Meat. A continuous, economical method of dehydrating the cheaper cuts of beef, pork, and lamb so that their quality would be maintained and they could be readily rehydrated would have many obvious advantages. Such a process would make possible new meat products such as puffed confections, improved ingredients for dried soups and similar products (to which water is added), and ingredients for meat foods prepared commercially or in households. A process is needed for this purpose which would be much less expensive than freeze drying. Explosive puffing, which has been used to facilitate the drying of fruits and vegetables and to reduce the time required for their rehydration, may be applicable to meats. Experiments should be undertaken to establish the best conditions for explosive puffing and also the best air temperatures and humidities to be used in drying the meat both before and after puffing.

3. Poultry and Eggs

a. Chemical Composition and Physical Properties. The rapidly changing poultry industry makes important use of fundamental information of poultry and eggs. Research should be expanded on the composition and properties of components of poultry and eggs in order to provide a sound basis for the development of new processes and products.

b. New and Improved Poultry and Egg Products. The increasing demand for ready-to-serve poultry- and egg-containing products of high quality whether cooked, frozen, canned, or dried offers important opportunities for increasing poultry meat and egg markets. An expanded research program on the major factors influencing quality, stability, wholesomeness, and processing costs is needed. The program should include only a limited effort on formulation. Major emphasis should be placed on developing principles of processing and storing that would be widely applicable in the production of superior poultry meat and egg products and on the development of products that would be useful in formulation of other foods, including emulsifying and binding properties of component parts. Studies are needed to determine chemical and physical properties of texture and other quality changes in poultry meat caused by processing such as canning, dehydration, and irradiation as a basis for developing superior products that can reach markets with little or no refrigeration.

c. Processing Poultry for Optimum Tenderness. Under present continuous-line processing procedures, optimum tenderness does not develop in poultry meat. The alternative, the use of long-time tenderizing periods, is inconvenient and costly. In order to accelerate the development of rapid, economical processing methods that also assure tenderness, basic and applied studies of tenderness should be expanded with emphasis on the mechanism of tenderization and the processing factors that influence it.

d. Flavor of Poultry Meat Products. Much of the frozen, dehydrated or otherwise processed poultry has varied widely both in natural poultry flavor and in development of off-flavors. Basic research should be expanded to provide a more exact relation between poultry constituents and organoleptic response to the products.

e. Improvement of Egg Pasteurization Treatments. Following up on the commendable development of successful pasteurization methods for egg white as well as whole egg, specific studies should be conducted to thoroughly evaluate important physiological and environmental factors that influence the resistance of salmonellae to destruction in order to develop milder and less costly pasteurization treatments for all types of egg products and also poultry products; and most important, studies are needed to determine the processing and control steps necessary to avoid postpasteurization contamination.

4. Food and Industrial Uses of Animal Fats

a. Edible Animal Fats. In less than two decades the use of animal fats in shortening has increased from almost nothing to about one billion pounds per year. Research is prominent among the factors which have brought about this remarkable change in the acceptability of animal fats in this basic food outlet. However, little change has taken place in the use of edible animal fats in margarine and continued growth in the uses for lard and edible tallow in shortening and margarine depends largely upon stepping up research on the isolation, identification, characterization and modification of the molecular constituents of these animal fats and their edible derivatives.

b. Inedible Animal Fats. The 4.5 billion pounds per year output of inedible animal fats is one of the two most important byproducts of the livestock industry. It is of major concern because during the past fifteen years production has doubled while use in soap declined by half. The most promising potential for increasing domestic uses for inedible animal fats appears to lie in the further development of new chemicals which are useful in such large volume outlets as plastics, plasticizers, lubricants, lubricant additives and biodegradable detergents. Development of fat-based detergents with their excellent biodegradability would be an excellent contribution to the solution of problems related to preservation of supplies of potable water. Research should be expanded to provide the information and background essential to development of new outlets in these market areas.

5. Wool and Mohair

The Department's WURLAN treatment of wool for machine washability and shrinkage is receiving increasing commercial attention.

a. Durable Press. The Committee strongly urges greatly accelerated research toward development of superior durable press wool and mohair apparel products through new chemical treatments and scientifically designed woolen and worsted fabric structures. Durable press is of significant importance to the consumer. Superior wool and mohair products that could result from this research would provide savings to the consumer in apparel upkeep and service costs.

b. Woolen System. It is recommended that facilities be provided at Albany, California, and research be initiated on the woolen system of wool processing in order to take advantage of wide opportunities, including durable press, which have been opened for wool. Present Department facilities there are limited to the worsted system. The manufacture of woolen fabrics presents unique problems in blending, carding, spinning, and finishing which are not receiving attention at present. Moreover, the woolen system of manufacturing consumes a greater proportion of domestic wools.

c. Composition and Physical Properties. Basic research on wool and mohair composition, structure and stability needs to be continued and expanded in order to provide the necessary adequate fundamental knowledge for future development of new and better products. Modifications of wool are needed that impart permanent resistance to wrinkling, soiling, yellowing, and to microbial and insect attack.

d. Modified Wool. Research should be initiated to explore promising leads on chemical grafting of polymers to wool that lead to superior new and desirable performance characteristics. The possibility should be investigated that chemically modified wools can be developed that would increase the percentage of wool fibers now used in wool-synthetic blended fabrics.

6. Hides, Skins and Leather

Physical, chemical and biological investigations on hides and skins need to be strengthened in order to develop information on the properties of collagen and the other components to permit their use in areas other than the traditional leather markets. Emphasis should be continued on investigations of the dispersion and reconstitution of collagen fibers from the less desirable areas of hides and skins to create new and nonconventional products especially for utilizing its mechanical and physical properties as matrix and structure in food application. Following upon the successful commercialization of glutaraldehyde tanning of cattlehides for improved shoe uppers and of wool skins for launderable hospital bedpads and improved paint rollers, continued studies are recommended on the chemical modification of hide proteins to develop leathers with additional new and improved properties, and on developing new processing methods to obtain greater economies in leather production in order to enhance its competitive position with the growing body of substitutes.

B. Human Nutrition and Consumer Use Research

1. Expanded Program in Food and Nutrition

In line with the Department's goal to advance the level of living of individuals and families this Committee reaffirms its support for immediate implementation of the long-range plans for research in foods and nutrition projected in the 88th Congress Senate Document 35. The essence of the recommendations in that document are that the present scale of research in food and nutrition is inadequate in light of the Department's responsibilities and the Nation's needs.

The Committee is pleased to learn that funds have been appropriated to plan a new regional laboratory for food and nutrition research in Grand Forks, North Dakota, and recommends that funds to build this facility be provided promptly and plans made for comparable facilities in the southeast and southwest.

We urge that high priority be given to construction of the headquarters facility planned for the expanded program. Present headquarter facilities are scattered and do not provide for nutrition studies with human subjects. We feel it is most desirable that research and administrative activities of this headquarters food and nutrition program be brought together into a single facility in the Washington area adequate to meet their long-range mission.

2. Human Nutrition

Clarification of the role of diet in fat metabolism, obesity and weight control is needed if animal products are to make their maximal contribution to the health and well-being of consumers.

The Committee noted with interest the research progress of the Department nutritionists toward a better understanding of the interaction of nutrients and the relationships between foods and nutritional responses. We recommend a major expansion of this research to permit these leads to be followed up and to permit their application to studies of fat metabolism and deposition in human subjects.

3. Food Handling and Cooking

Too little attention has been given to the preservation of eating quality and microbial safety in foods after they reach the household or food service consumer although good consumer use practices are essential to the maintenance of quality until food is eaten. The Committee recommends that research be expanded on the problems encountered in maintaining quality under household and institutional conditions where a wide variety of foods must be stored in close proximity and in facilities having limited cooling and air circulation capability. The continual increase in the number of meals and snacks eaten away from the home has increased the urgency of the need for information applicable to food service institutions. We recommend that particular attention be given to the problems of refreezing foods and food combinations. Also, this research effort needs to be coordinated with other research pertaining to things that happen to foods before they reach the consumer. For example, the market quality research recommended under "Quality Maintenance of Eviscerated Poultry" (page 20) would be of importance in developing information for consumers.

4. Nutrition and Consumer Use Research

Review of research findings on the nutritive value of foods should be continued as required to keep the basis of Agriculture Handbook No. 8 up-to-date. The scope of the work should be expanded to include additional nutrients not now included in the handbook such as vitamins B_6 and B_{12} and pantothenic acid. Data on nutritive value of foods should be provided in terms of household and market units to make the information more directly useful for a wider application by the consumer.

5. Food Consumption Survey

The 1965 Nationwide Food Consumption Survey will provide a wealth of data with valuable implications for food industries and consumer services. The early release of the findings should be expedited. These should be followed by a series of commodity-oriented summaries with the household data adapted specifically for use in consumer education programs and in marketing research concerned with production, utilization, and distribution of agricultural products. The data on the diets of individuals should be studied for information that would be useful in understanding food habits and would be useful in developing nutrition education programs.

VI. MARKETING AND ECONOMICS

A. Market Quality

1. Market Quality of Fluid Milk as Affected by New Methods of Handling. Recent developments in the handling, transportation, and processing of fluid milk have caused many changes in the merchandising of this product. Research should be initiated to determine the effect of these new practices on the keeping quality of fluid milk. Information is needed on (1) the effect of the ultrahigh temperature extremely short-time pasteurization procedures on flavor and other quality attributes of milk during the time it is in storage and channels of distribution, and (2) on the numbers and kinds of microorganisms in milk marketed under these newly created conditions.

2. Shelf Life of Milk Products. Research is needed to determine methods of extending shelf life of milk products particularly with respect to the deterioration of milk fats during shelf life.

3. Beetles Attacking Nonfat Dry Milk. Several species of dermestid beetles have caused serious trouble in storage warehouses. Research should be initiated to obtain information on the distribution of the various species involved, how they spread, and what the sources of infestation hazard may be for dry milk in storage. Also, research is needed on the biology, ecology, and behavior of these beetles under the environmental conditions that exist in warehouses. Information from such research could be used to develop better preventive and control procedures.

4. Standards for Grades. Improvement in standards for meat grading are needed and should emanate from current research. It is vitally important that better methods of quantitative and qualitative evaluation of both live animals and dressed meat should be developed.

5. Shelf Life of Fresh Meat. Additional work is needed to increase the shelf life of fresh meats in retail markets in addition to the research already conducted on refrigeration, sanitation, and lighting. It is vitally important to all the retail food industry to conduct research on packaging materials and treatments of film and/or meats themselves which will help hold the blood life of meats.

6. Salmonella in Eggs, Poultry and Poultry Products. Research should be expanded to reduce the incidence of salmonella in all eggs and poultry. There is need to improve processing plant methods and develop new techniques which would include work on further processed eggs and poultry. Investigations need to be made to determine under which conditions salmonella

proliferate in feedstuffs, poultry, eggs, and in egg and poultry products. Also, improved methods are needed for testing salmonella in eggs and poultry meats. The methods need to be simple, rapid, reliable, and economical. (Also see "General Recommendation", page v, and "Diseases", page 9.)

7. Quality Maintenance of Eviscerated Poultry. Research should be continued to determine the effects of various existing methods (as well as new or improved methods) of slaughtering, scalding, defeathering, eviscerating, chilling, packaging, transporting, and holding on the quality of eviscerated chickens and turkeys. Factors such as appearance, shelf life, flavor, tenderness, and wholesomeness as affected by various processing techniques should be studied. Basic research to elucidate the physiological, chemical and physical processes involved in the maintenance of poultry meat quality should be an integral part of this study.

8. Proper Heat Processing Procedures for Poultry. Research is needed to determine what heat processing procedures should be used to attain safe, precooked poultry meat products without impairing product quality.

9. Wholesomeness of Poultry. Immediate research is needed to establish whether or not the wholesomeness of an entire bird is affected when small evidences of leukosis on the skin or internal organs are visible. At present the Poultry Inspection Service permits no trimming in such cases but requires that the entire bird be condemned.

10. Standards for Mohair Classification. A set of standards for mohair classification should be established including measurement of fiber length, density, fineness, and character.

11. Objective Measurement of Market Quality of Wool. Improvement of present methods for measuring quality factors will contribute to the development of better grading procedures that will be more closely related to processing performance and product quality. Additional work is needed on the problems of relating the strength of fiber to visual characteristics and determining the incidence of colored and foreign fibers. Research should be expanded to develop improved methods for the quality appraisal of wool.

12. Fabric Insect Control in Homes and Commercial Establishments. Many of the most effective materials in common use for moth control are highly toxic to humans. A somewhat parallel situation existed a number of years ago when arsenic compounds were used as fabric treatments. Research should be conducted to find safe, effective pesticides and improved methods for using them against fabric pest infestations in homes and commercial establishments.

B. Equipment and Facilities

1. Dairy Products. The Committee does not recommend additional research on automation of small dairy plants. It believes that private companies have more than satisfied the need for research in this area and the research effort should be used for more urgent work.

2. Livestock, Meat and Wool

   a. Layouts and Work Methods for Cattle Feedlots. Engineering research is needed to develop layouts and work methods for floored and covered cattle feedlots that would minimize operating costs.

b. Layouts and Work Methods for Wool Warehouses. Engineering research is needed in wool warehouses to develop standards for container size for receiving wool and packaging for handling, storage, and shipment. For many years grease wool has been handled by manual methods with excessive labor costs in warehouses scattered throughout production areas. Some structures are outmoded which make adoption of new techniques impractical.

c. Layouts and Operating Criteria for Livestock Auction Markets. Sale of livestock by auction has grown rapidly during the last thirty years. This rapid growth has taken place without adequate research to provide principles and guidelines for flow patterns, handling techniques, facility requirements, crew sizes, pen arrangements, market practices, and labor requirements. Engineering research on these problems was conducted during the period 1949 through 1957. There is a need to broaden and update this research.

d. Edible Fat Rendering Plants. Research is needed to investigate the practicability of small edible fat rendering plants for use by packers, wholesalers, and retailers.

3. Poultry and Eggs

a. Water Conservation in Poultry Processing Plants. The urgency for the need of water conservation is recognized throughout the country. This need is becoming particularly critical in food industries where potable water is required in the processing operations not only as the use rate affects the supply for human consumption but also as a cost factor. In recent research involving improvement of handwashing equipment for the chicken eviscerating operation it was found that in plants with similar production loads water consumption rates ranged from 8 to 30 gallons per minute. Limited improvements in nozzle design indicated that reductions up to 300 percent were possible in some cases while the washing job was actually improved. Further study in this area as well as the other processing areas that are high in water consumption is needed in order to develop sound water conservation practices in poultry processing plants.

b. Processing Engineering. The purpose of research in this area would be to improve methods, equipment, and product quality in poultry plant processing.

It is strongly urged that investigations designed to improve plant processes relating to procurement, slaughtering, defeathering, eviscerating, chilling, boning, cooking, packaging, storage, and transportation be continued and expanded. Since there has been an increased incidence of poor bleeding during slaughtering, particular emphasis should be placed upon this phase of processing in order to improve product quality. Giblet processing deserves a complete study of engineering equipment for better efficiencies.

c. Handling and Bruising of Live Poultry. Economic losses from downgrading of poultry due to bruising, tearing, and breaking probably equal or surpass total losses from condemnations. These conditions result from improper and antiquated handling and hauling methods

for live poultry, an area in which the industry has made very few changes in forty years. Research on these conditions is now in progress by USDA-ARS at the University of Georgia. It needs to be expanded and intensified as much as possible due to the tremendous economic potential for the poultry industry.

4. Consumer Packages and Shipping Containers for Milk and Poultry. The Committee feels that further research is not needed in this area by the Department since private industry is rapidly developing improved packaging and shipping containers. It is felt that previous manpower used in this area could better be devoted to those fields of research which the Department can do better than private industry.

C. Cooperative Marketing

Research is needed to help evaluate the scope and potentials of cooperatives especially the possibility of undertaking economic alternatives as a means of improving the economic condition of dairy, livestock, wool and poultry producers.

1. Increased Marketing Effectiveness through Coordinated Programs
Additional research is needed to determine how various local and state cooperatives can coordinate their programs to strengthen bargaining in the market similar to that of other corporations that operate nationally and in foreign markets. Studies are needed to determine whether there are opportunities for cooperatives to use more direct movement of products to consumers in both domestic and export markets and thereby provide greater savings for members.

2. Organizational Structure, Functions, and Efficiency of Cooperatives

The following areas need further study:

a. Organizational Structure. The effects of both horizontal and vertical integration of cooperative organizations need to be evaluated. The study should include costs of programs, methods of financing, benefits, and how farmers would maintain control of decision-making.

b. Integration of Additional Activities. Intensive study is needed on the feasibility of cooperatives serving livestock, wool, and poultry producers by increased activity in the fields of feedlot operations, marketing, slaughtering, processing, and distribution.

c. Marketing Practices. Alternative marketing methods need to be evaluated such as different methods of grading, contractual arrangements for handling livestock, and the use of futures markets.

d. Operating Efficiency. Studies need to be made of the efficiencies in operations of cooperatives in various fields. A specific need is to furnish dairy cooperatives with guidelines for planning efficient milk assembly and surplus milk handling systems.

e. Pooling. An analysis of pooling is needed to determine its relationship to marketing costs, the establishment of prices, and more equitable returns to members of cooperatives.

D. Economics of Marketing

1. Adequacy of Market Price Information. Additional attention needs to be given to problems of collection, evaluation and dissemination of representative market price information. As markets decentralize the assembly, evaluation, and dissemination of daily and hourly information of livestock supplies, prices, and values become more costly and less efficient. Adequate information is a prime necessity to our marketing system. Although this recommendation was made last year and some progress has been made, the Committee feels that adequate research has not been completed to satisfy the needs of this request.

2. Report on Intentions by Broiler-Hatching Egg Producers. Research is needed to determine the feasibility of establishing an intentions report that would be available ninety days in advance which would indicate the number of day-old breeding chicks being placed by broiler-hatching egg producers. The basic problem is to determine at what point decision-making is established to increase or decrease broiler production. Additional data are needed to know how to build such a program regarding future changes in broiler production.

3. Distribution of Lamb and Mutton. The sheep industry has relied heavily on a study of distribution of lamb and mutton in the United States as it occurred in 1954. Due to the high level of mobility of the population and its expansion, it is reasonable to assume that consumption patterns for lamb and mutton have changed in the past twelve years. It is recommended that research be conducted to bring the above study up-to-date.

4. Overall Study of Livestock Marketing. The Committee wishes to repeat the recommendation made last year for an overall study of livestock marketing. It is the feeling of the Committee that the Department has not recognized the importance and urgency of this recommendation and respectively urges more serious consideration. We would like to direct attention particularly to three areas:

   a. The need to know costs of marketing as determined by the large number and variety of markets and market institutions.

   b. The need to document the trends in rise or fall of different types of markets and marketing and the factors contributing to those trends.

   c. The need for data to project the types of markets and marketing and businesses to operate in the system in the future.

5. Efficiency and Impacts of Multifunction and Multiplant Operations in the Poultry Industry. Many poultry and egg processing firms are becoming involved with further processing operations and are also becoming associated with assembly, input-supplying, and distributing functions. Some firms also have acquired several processing plants, hatcheries, and feed mills. Multiple functions and multiple plants pose additional managerial, purchasing, selling, and administrative problems. Research is needed to determine the nature and extent of economies and diseconomies with respect to complex organizations and the effects of such organizations' policies on the determination of prices and returns in the industry.

6. Market Information in Decentralized Markets. One of the major problems in livestock marketing concerns the changing nature and structure of the channels of live animal marketing and the information flowing to farmers marketing livestock. This was a simpler problem when livestock were marketed through terminals and buyers and sellers were together in single locations. It has become an increasingly complex problem as livestock are sold closer to points of production and slaughtered and processed there.

Longstanding trends toward decentralization have substantially changed the structure of livestock marketing. At the same time they have put persistent and serious pressures for change on existing channels of market information. Research is needed to determine the need for and the feasibility of collecting and disseminating the information farmers need to make decisions about where to sell their livestock.

7. Standardization of Hide Marketing Practices. Federal grades and standards for hides have never been recommended nor has the industry ever established uniform trading standards. This situation may make it increasingly difficult to market our hides in domestic and foreign markets. The fact that the United States is now the world's leading hide export country plus the development of leather substitutes underscores the necessity for the hide industry to improve its marketing practices in order to keep its present markets and expand foreign markets. Research should be initiated to determine the feasibility of developing methods of standardizing hide marketing practices. The objectives of such a study would be to determine possibilities for (1) improving quality and increasing the uniformity of hide selections, and (2) standardizing hide marketing practices. By implementation of accepted standardized practices, domestic and foreign buyers will benefit through a better quality and more uniform product. Moreover, packers and dealers can realize cost savings in their hide hauling operations.

8. Effect of Promotion and Merchandising on Consumer Demand for Livestock and Poultry Products. Livestock and poultry producers are spending an estimated $7 million annually for promotional purposes in an effort to strengthen demand for their products. It is proposed that research be expanded to provide information that would assist these groups in planning and developing more effective marketing programs and activities for livestock and poultry products. Specific objectives of this research would be to determine basic forces affecting the demand for livestock and poultry items and the influence of selected pricing, promotional and merchandising practices on sales and returns to various segments of the livestock and poultry industry.

E. Supply-Demand Research, Situation, Outlook, and Projections

The Committee commends the Department for initiating the study on hogs regarding cyclical instability in price and supply movements. This work is important and timely. Also, we encourage the studies on changing patterns in the demand for meat, dairy products, poultry and eggs when the data from the 1965 Household Food Consumption Survey becomes available.

1. Cattle on Feed Reports. Consideration should be given to making the cattle on feed reports more useful in the marketing of feeder cattle. Addition of some of the Corn Belt states to the monthly report would be helpful -- reporting the thirty-two states monthly instead of quarterly would be more helpful but possibly too expensive. However, it may be practical to report additional states on a monthly basis just for the months during the main

feeder activity. One suggestion that would not add to the cost would be to have the quarterly reports prepared one month earlier. For the thirty-two states reported quarterly, the July report is out-of-date and the October 15 report is not out yet at the time when Corn Belt agencies are doing the bulk of their feeder business.

Because the application of technology has brought about rapid changes in cattle feeding, it is felt that additional research should be conducted to determine whether more weight range classifications should be added to the report of cattle on feed.

2. Feeder Cattle Grades. The present United States grades for feeder cattle are not expressed in terms consistent with the trade or practice. There is a need to demonstrate the adequacy of present grades or to conduct research leading to new grades and terminology consistent with the trade and feeding practices.

3. Livestock Inventory. Research should be conducted that would indicate how to achieve greater accuracy in the livestock inventory report issued on January 1 each year. It was felt that quarterly reports should be made also since the interval of the present report is too long.

4. Study of Methods of Reporting Milk and Dairy Products Consumption. Currently, use of milk in major products is measured on a milk equivalent basis. In some cases this method does not adequately recognize trends in use of skim milk items even though consumption of major as well as minor products are reported in product pounds including sales of fluid milk items. Therefore, present methods need to be reviewed with the Statistical Reporting Service and key industry persons to develop series to measure consumption trends more adequately.

5. Milk Supplies and Needs - Both Domestic and Foreign. Domestic consumption patterns of several dairy products have undergone substantial changes since the last comprehensive study of demand for dairy products was made in the mid-1950s. These changes, along with dynamic changes in the production of milk and world requirements for animal proteins, are critically affecting the production-utilization balance of milkfat and solids-not-fat. A comprehensive analysis of the factors affecting demand, supply and price of milk and dairy products is needed to provide bases for evaluating different proposed programs designed for obtaining a better balance between domestic supply and needs -- both domestic and foreign.

6. Change in Supply Response for Eggs. Seasonality of egg production has been greatly reduced in recent years and the structure and organization of the egg industry has undergone major changes. These developments appear to have altered the industry's supply response materially. To measure this change in supply response more accurately, analyses of egg production should be carried out using a cyclical approach. Such analyses, recently developed for broilers, have proved to be quite helpful in forecasting supplies and prices.

7. Changing Supply-Price Behavior for Broilers. The rapid changes in technology, structure, financing and organization of the industry have substantially altered the response of consumers, marketers, and producers to changes in the price and supply of broilers. New analyses are needed to measure these behavioral changes and to provide a better basis for forecasting

supplies and prices. In particular, analyses based on wholesale prices for ready-to-cook broilers are needed to replace older ones using farm prices for live birds. Integration in production and marketing of broilers has progressed to such a degree that estimating prices of live broilers has become increasingly difficult.

F. Consumer Preference and Quality Discrimination

The Committee wishes to encourage the Department in its work with the National Livestock and Meat Board on opinions about meats.

1. Consumer Food Habits and Fads. Research should be initiated to determine who within a family eats or rejects selected foods and the underlying reasons for these choices such as an individual's concern about gaining or losing weight or other health problems. The study should also investigate the effect of restrictive diets for some family members on consumption by other family members of specific foods and whether the restrictive diets were prescribed by professionals (such as medical doctors, dentists, dieticians, etc.) or by the individual himself or other family members. Such research is essential to understanding and interpreting patterns of food consumption.

2. Consumer Preference for Leather in Shoes. Packers, hide dealers, and tanners have expressed concern about the possible effect of nonagricultural, leather-like materials on the market for leather in shoes. Newly developed synthetic materials threaten to seriously reduce the demand for leather in shoes; other substitutes which have been available for some time have already greatly reduced the demand for leather in luggage, handbags, garments, and other products. For example, since World War II leather's share of the market for luggage has decreased from almost 100% to approximately 5%. Since shoes are the only major remaining outlet for leather, information should be obtained from consumers to assist the leather industry in its efforts to maintain its competitive position in the shoe industry. A study should therefore be initiated to ascertain consumers' knowledge, experiences, preferences, and opinions regarding the relative advantages and disadvantages of shoes made of leather in comparison with shoes made of synthetic substitutes.